

Message

From: Frazier, William Mark [william.frazier@doh.hawaii.gov]
Sent: 3/3/2017 8:21:32 PM
To: steven.chang@doh.hawaii.gov; joanna.seto@doh.hawaii.gov; Pallarino, Bob [Pallarino.Bob@epa.gov]; Ronald Chinn [ron.chinn@innovex.net]
CC: Takaba, Richard R [richard.takaba@doh.hawaii.gov]; roxanne.kwan@doh.hawaii.gov; Whittier, Robert [Robert.Whittier@doh.hawaii.gov]; Donald Thomas [dthomas@soest.hawaii.edu]
Subject: FW: Navy new well locations (current site conceptual model)

The DOH was asked yesterday what is our opinion/to support installing three new wells within Halawa Valley west of Red Hill. If the goal is to show action – go ahead, install the three wells.

My comment is that the DOH technical support personal, Bob W., Don Thomas and myself are not unified nor fully supportive of this goal. I cannot speak for the DOH UST programs.

I understand there is a desire to show action before the possible May 2017 public meeting but suggest a change of focus/emphasis is needed. There is a need to clearly express “What is the question we are to answer”.

I would like to change the emphasis from putting in three new wells to: “Is the Halawa Valley shaft drinking well threatened?” If the answer to that question is no because we have barriers at the streams locations then the question becomes - prove it: “What is needed to confirm the barriers prevent flow from the tanks to the Halawa shaft well?”

I suggest applying the Site Conceptual Model (SCM) to express clearly how the fuel is moving in the area west of Red Hill tanks and to frame the Navy response. I presume the discussion is for Halawa shaft well only:

- 1) Would LNAPL from the Red Hill tanks travel west to the Halawa shaft well?
 - a. The SCM says LNAPL (free floating fuel) path is on the air water interface and would not travel the distance to the Halawa shaft, for the 2014 release.
- 2) Would dissolved fuel constituents travel to the Halawa Valley shaft?
 - a. The SCM says present stream locations (South and North Halawa streams) fronting the Halawa Valley shaft have barriers blocking water and contaminant flow to the drinking well. We don't know if this is true.
 - i. Do the barrier sediments actually block flow?
 - ii. What is the barriers lateral and vertical physical extent?
 - b. The SCM says dissolved fuel constituents could travel the distance west from the tank locations to the Halawa Valley shaft. How would the fuel contaminant migrate?
 - i. Dissolved fuel constituent's air water interface path would be blocked by the barrier, if present.
 - ii. Dissolved fuel constituents with its neutral buoyancy would form a thicker wedge within the water table as it moves west from the tank locations.
 - iii. Dissolved fuel constituents may pass under the barrier (diving plume).
 - iv. Dissolved fuel constituents may move around the barrier (possibly north or uphill) with the groundwater flow.
- 3) How does the groundwater flow: locally under the tank area, then between valleys, or regionally between aquifers?
 - a. Save this one for another day

Therefore:

Let the Navy determine how to address "Is the Halawa Valley shaft drinking well threatened?" "What is needed to confirm if the barriers prevent flow from the tanks to the Halawa shaft well?" Let the Navy answer do the barriers stop diving plumes or flows around the barriers.

I would suggest don't say how many wells. As Bob W. frequently has stated, look at the present geochemical data, run geophysics to locate the barrier width and length, install wells to confirm the barriers vertical extent and address if water flow is under the barrier or around it. Later, use tracers to confirm flows.

Regards

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From: Frazier, William Mark

Sent: Tuesday, February 28, 2017 9:09 AM

To: Ron Chinn <ron.chinn@innovex.net>; Takaba, Richard R <richard.takaba@doh.hawaii.gov>; Whittier, Robert <Robert.Whittier@doh.hawaii.gov>; TU, LYNDSEY (Tu.Lyndsey@epa.gov) <Tu.Lyndsey@epa.gov>; Donald Thomas <dthomas@soest.hawaii.edu>

Cc: Pallarino, Bob <Pallarino.Bob@epa.gov>; Chang, Steven Y <steven.chang@doh.hawaii.gov>; Seto, Joanna L <joanna.seto@doh.hawaii.gov>; Uehara, Norris N <norris.uehara@doh.hawaii.gov>

Subject: RE: Navy new well locations (current site conceptual model)

Perhaps greater clarity can be achieved if the regulators request/demand a current site conceptual model (SCM) that reflects the Navy/AECOM understanding, as of February 2017. The current SCM should include:

- Red Hill Geology (saturated and unsaturated regimes)
- Groundwater gradient (local under the tanks, then regional)
- Possible subsurface barriers (dikes, cap rock, Salt Lake volcanics, alluvial/saprolite contacts)
- Map showing where contamination is located, now and historically (>EAL and observed LNAPL (i.e. in the tunnel and in wells))

So far the site conceptual model approach while carefully considered and thoughtful has yielded lengthy deliberations that are ambiguous and inconclusive for all parties.

For the sake of being clear and easily understood, both for us and the public, we need current SCM cross sections and contour maps. If the Navy/AECOM is not forthcoming, then the EPA/DOH needs to produce our own SCM cross sections and contour maps.

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From: Whittier, Robert

Sent: Monday, February 27, 2017 11:02 AM

To: Ron Chinn <ron.chinn@innovex.net>; Donald Thomas <dthomas@soest.hawaii.edu>

Cc: Pallarino, Bob <Pallarino.Bob@epa.gov>; Chang, Steven Y <steven.chang@doh.hawaii.gov>; Frazier, William Mark <william.frazier@doh.hawaii.gov>; Takaba, Richard R <richard.takaba@doh.hawaii.gov>

Subject: Re: Navy new well locations

Hi All,

Yes I agree, AECOM does not seem to have a great understanding of regional groundwater flow and hydrogeology. This is required to assess the risk that a major release at the Red Hill facility would pose to our current drinking water sources and to drinking water aquifers; and what actions should be taken if such a release were to occur.

But I would also submit that before planning any new wells, the available data should be evaluated in detail and options that are available other than drilling new wells explored. Also, all parties should come up to speed on other related work/research that is being done that will help answer the critical questions.

It costs about \$250K to drill and install a monitoring well. Add to that the sampling and analytical costs and it goes up from there. With a well you "learn in great detail a vertical column that is about 1 ft in diameter". That is a somewhat facetious comment but the bigger point is how do you connect the dots (i.e. extrapolate between the wells)? For \$250K a lot of information could be acquired to help connect the dots. Also, monitoring wells only give us information down to about 10 ft into the water table. The aquifer extends about 700 ft below that.

Currently, RHMW10 is in progress or will soon be, a TOC elevation survey will be conducted, and AECOM is going to complete their data compilation and report. That would be the time to discuss new wells or new approaches. I would suggest a small Red Hill Technical Working Group of knowledge groundwater professionals and researchers evaluate current data and offer recommendations.

As far as RHMW11, when AECOM changed the location to the bank of S. Halawa Stream my input was that was not a good investment in money. I agreed that it would provide some input on the depth of the valley fill and saprolite. However, at that location the stream is up against the mountain slope so I think AECOM will be disappointed in the findings. I believe, Ron, that you have expressed similar misgivings about that well. At this point I don't how far along the Navy and AECOM are in process of putting in that well, but it wouldn't be the end of the world for them if they were directed to hold off until a good review and interpretation of the existing data could be done. This should not hold up their modeling. If they are doing the modeling right, they would be running groundwater flow simulations right now to increase their understanding of area and help plan the rest of the work.

As far as USGS involvement goes, I feel it should happen early and often. We I get in controversial situations I always get hit with "has this been reviewed by the USGS?" or "what does the USGS have to say?". This advice comes with a caveat, you won't get anything definitive from the USGS unless they are a funded participant in the project and can subject what they say to internal peer review. Also, even with peer review their directive is not to make definitive recommendations but rather layout and interpret the data for their project sponsors. However, they will provide comments and having frequent involvement with them I feel will be a hedge against criticism.

Seems like there was another subject I wanted to cover, but it escapes me now. However, everyone agrees that understanding the geometry of the valley fill is an important question to answer. However, the center of the valley fill may not be the optimum location for a monitoring/sentinel well. I haven't costed this, but I assume that a geotech boring is significantly cheaper than a monitoring well. A series (and only a series) of

geotech borings will unambiguously answer the questions about the geometry of the valley fill. Geotech borings coupled with geophysics may make it possible to increase the coverage while decreasing the number of geotech borings. This is just an example that comes to mind.

Thanks,
Bob W.

From: Ron Chinn <ron.chinn@innovex.net>
Sent: Saturday, February 25, 2017 10:16 AM
To: Whittier, Robert; Donald Thomas
Cc: Pallarino, Bob; Chang, Steven Y
Subject: Navy new well locations

Hi Bob & Don -

After our meetings last week, our friends at EPA had several internal discussions about where the Navy currently stands and whether they're going to collect the data necessary to develop a defensible conceptual site model. It seems that the general consensus is that without an explicit directive to do so, they're probably not going to figure it out and proceed on their own. The plan is therefore to issue a regulatory directive for further characterization and the installation of additional wells.

I'd like to work with you folks to figure out what we want the Navy to do. They're already planning on installing RHMW11, which is supposed to be center of the South Halawa valley. I'm thinking about asking them to install a well around the quarry, and another in the center of the North Halawa valley. The Navy was thinking about installing a well around Tripler, but I suggested that this wouldn't provide much useful information since it's so far inland of the Moanalua wells (which I imagine are locally influenced by the Salt Lake/Ahuimanu tuff). That money could be better spent elsewhere.

Do you have any time on Monday to discuss? I'd like to hear your thoughts with respect to well placement in order to make sure that the groundwater model incorporates structures that may influence shallow groundwater movement between Red Hill and Halawa shaft. Bear in mind that we probably don't want to go overboard in our directives – we want to make sure we get the best bang for the buck.

Thanks!
—Ron

Ron Chinn, PE, PMP, CHMM
President & CEO

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